

**CENTRAL KITSAP WASTEWATER TREATMENT PLANT
CLASS II INSPECTION
NOVEMBER 29-30, 1988**

by
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ABSTRACT

A class II inspection was conducted at the Central Kitsap Wastewater Treatment Plant (STP) on November 29-30, 1988. The plant is an activated sludge secondary facility discharging into Port Orchard Bay as regulated by NPDES Permit #WA-003052-0. The STP was upset during the inspection resulting in effluent exceeding NPDES permit biochemical oxygen demand (BOD_5), total suspended solids (TSS), and chlorine residual concentrations. Numerous priority pollutants were detected in one or more of the samples collected. Most were found in low concentrations. The STP effluent demonstrated some toxicity to rainbow trout and Microtox. The sediments were not toxic to amphipods (Rhepoxynius abronius) or Microtox.

INTRODUCTION

A class II inspection was conducted at the Central Kitsap Wastewater Treatment Plant (STP) on November 29-30, 1988. The plant is an activated sludge secondary facility discharging into Port Orchard Bay as regulated by NPDES Permit #WA-003052-0. Receiving water sediments were collected near the outfall on November 28, 1988, as part of the inspection. Objectives of the survey included:

1. Assess plant compliance with NPDES permit discharge limits.
2. Assess the permittee's self-monitoring by reviewing laboratory, sampling, and flow measurement procedures. The assessment will include sample splits for analysis by the Ecology and Central Kitsap labs.
3. Characterize effluent toxicity by conducting priority pollutant scans and bioassays.
4. Characterize loadings from the Navy bases including priority pollutant scans.
5. Assess impacts to receiving water sediments by conducting priority pollutant scans and bioassays.

The survey was conducted by Keith Seiders, Norm Glenn, and Marc Heffner of the Ecology Compliance Monitoring Section. Ralph Declements, operations supervisor at the plant, provided on-site assistance.

SETTING

The STP is operated by the Kitsap County Public Works Department. Plant loading includes influent and septage. Plant influent flow is approximately 2.3 MGD including domestic flow and flow from the Navy-Bangor and Navy-Keyport facilities. Septage flow is approximately 20,000 gpd.

The plant flow scheme is outlined in Figure 1. The treatment process includes primary clarification, activated sludge, secondary clarification, and chlorination. The activated sludge system is a complete mix mechanically aerated system. During the inspection all the clarifiers and two of the four aeration basins were being used. The system is set up to allow effluent from any activated sludge basin to be sent to either secondary clarifier, but the flow from any one basin cannot easily be divided equally between the two secondary clarifiers.

Primary and secondary waste sludges are sent to separate gravity thickeners. The thickened sludges are combined and digested in the primary digester, then held in the secondary digester. The sludge is dewatered using a filter press and sent to the Olympic View Sanitary Landfill where it is utilized as top cover material.

Septage is screened, comminuted, diluted, and degritted before being sent to a gravity thickener along with the waste activated sludge (Figure 1). The gravity thickener overflow is routed into the plant flow downstream of the influent monitoring station, while the solids are sent to the digester. Because the septage is mixed with the waste activated sludge in the gravity thickener, the septage load to the liquid stream portion of the plant cannot be measured.

PROCEDURES

Ecology sample collection included composites and grabs. Ecology Isco composite samplers were set up to collect influent, primary effluent, and final effluent samples at the STP (Figure 1) and effluent samples at the Navy-Bangor and Navy-Keyport bases near the respective effluent flumes. Samplers were set to collect equal volumes of sample every 30 minutes for 24 hours. Sampling quality assurance/quality control steps included priority pollutant cleaning samplers prior to the inspection and collecting a field transfer blank sample (Table 1). Samples collected, sampling times, and parameters analyzed are summarized in Table 2. Kitsap County also collected composite samples of STP influent and effluent, and effluent from the Navy bases. The Kitsap County samplers collected equal volumes of sample every 30 minutes for 24 hours. Ecology and Kitsap County samples were split for analysis by both the Ecology and Kitsap County labs (Table 2).

Receiving water sediments were collected with a van Veen grab sampler at three stations; two near the outfall diffuser and one at a background site (Figure 2). At each station, the top two centimeters of sample from two grabs were collected. One-half of a VOA bottle was filled from each grab while the remainder of the sample was put in a stainless steel bucket. After the second grab, the contents of the bucket were homogenized and put in appropriate containers. Sampling quality assurance/quality control steps included collecting only sediment not in direct contact with the sampler and pre-inspection priority pollutant cleaning of equipment that would touch the samples (Table 1). Sampling times and parameters analyzed are included in Table 2.

Samples for Ecology analysis were placed on ice and delivered to the Ecology Manchester Laboratory. Analytical procedures and the laboratories doing the analysis are summarized in Table 3.

RESULTS AND DISCUSSION

General Chemistry and NPDES Permit Parameters

The plant appeared to be in a partially upset condition during the inspection; plant performance was less than expected (Table 4). Effluent BOD_5 , TSS, and chlorine residual concentrations exceeded NPDES permit limits (Table 5). Influent plant flow was approximately one-half of plant capacity while BOD_5 and TSS loads were approximately one-third of capacity. Operating one-half the plant (one primary clarifier, two aeration basins, and one secondary clarifier) could provide useful information about actual plant capacity.

Comparison of effluent BOD_5 (>60 mg/L) and effluent inhibited BOD_5 (14 mg/L) suggest nitrification was occurring; while the effluent NH_3-N concentration (approximately 20 mg/L) indicates that nitrification was not complete. The extent of nitrification was difficult to estimate. The inspection samples found a higher NH_3-N concentration in the primary effluent (34 mg/L) than in the plant influent (25 mg/L), presumably due to return flows entering the flow downstream of the influent sampling station (Figure 1). The total inorganic nitrogen concentration (TIN; $NH_3-N + NO_2+NO_3-N$) in the final effluent (23 mg/L) was less than in the primary effluent (34 mg/L) suggesting denitrification was occurring. The long detention time in the secondary clarifiers as a result of using both units when the flow was one-half of STP capacity suggests denitrification may have been occurring in the clarifiers. Denitrification may have contributed to the partially upset condition observed at the STP.

The plant influent flow meter appeared to be measuring accurately (Table 6).

General chemistry results from both the Bangor and Keyport samples suggest the discharges were similar to domestic influent (Table 4). None of the general chemistry parameters measured suggested the sewage was significantly different than the Central Kitsap STP influent, although both facilities had higher total solids (TS) concentrations and the Keyport sample had a higher NH₃-N concentration. Flow meters at both of the facilities did not appear accurate (Table 6). The Keyport meter appeared approximately 30 percent too high while the Bangor meter was very erratic and a reasonable flow estimate could not be made.

Priority Pollutants - Water and Sludge

Numerous priority pollutants were detected in one or more of the samples collected (Table 7). Most were found in low concentrations. A complete list of parameters analyzed, concentrations found, and detection limits is included in the Appendix. The Navy-Keyport sample had somewhat elevated concentrations of acetone, 4-methylphenol, benzoic acid, and zinc. The Navy-Bangor sample contained several VOA compounds (Benzene, Toluene, and Total Xylenes), copper, and cyanide in the 50-150 ug/L range. Acetone was present in several samples in the 90-140 ug/L range as well as in the transfer blank. Several of the parameters detected in the STP influent were not detected in either the Keyport or Bangor samples, suggesting the facilities were not the sole source of priority pollutants entering the STP. Inability to collect a Keyport composite makes the observation less conclusive. The data indicate in-plant reduction or removal of most of the parameters observed in the STP influent sample.

The list of priority pollutants found in the treatment plant samples and those found in the sludge sample are similar, although fewer parameters were detected in the sludge (Table 7). Similar detection lists suggest the compounds detected in the STP samples are routinely present. Central Kitsap results for metals commonly analyzed in the sludge show the Central Kitsap concentrations fall within the range found in previous inspections (Table 8 - Hallinan, 1988).

Bioassays - Water

Bioassays found some toxicity in the STP effluent (Table 9). Rainbow trout (Onocorhynchus mykiss) experienced 27 percent mortality in the 100 percent STP effluent. Acute mortality was not noted in the Daphnia magna test while suspected cultural difficulties made the chronic results inconclusive (Stinson, 1989). The "need to further investigate toxicity" based on Microtox results received a moderate priority ranking (EPA, 1980).

Effluent priority pollutant concentrations were less than acute toxicity criteria (Table 7; EPA, 1986). The cyanide and copper concentrations were the only priority pollutants approaching acute criteria. The STP effluent NH₃-N concentration (22 mg/L) exceeded the calculated toxicity criteria for trout bioassay test conditions (13 mg/L), possibly accounting for the observed trout mortality.

Priority Pollutants - Sediments

Priority pollutants detected were in low concentrations in the sediments (Table 10). Most of the parameters detected in the sediments were either metals or high molecular weight polynuclear aromatic hydrocarbons (HPAHs), whereas no HPAHs were detected in the STP effluent. A complete list of parameters analyzed, concentrations found, and detection limits is included in the Appendix. All concentrations were less than the Ecology Interim Sediment Quality Evaluation Process Chemical Criteria; thus, no adverse effects on Puget Sound biological resources would be expected (Ecology, 1989a).

Bioassays - Sediments

As predicted by the chemical data, neither the amphipod (*Rhepoxynius abronius*) nor Microtox were significantly effected by the test sediments (Table 11). All amphipod test survivals were greater than 88 percent; exceeding the 75 percent minimum survival required to pass the test (Ecology, 1989a). The Microtox test showed no measurable toxic effects.

Laboratory Discussion

In March 1988, the Kingston STP, another plant operated by the Kitsap County Public Works Department, was inspected and a laboratory review was conducted at the central lab (Hallinan, 1988a). Only minor suggestions were made at that time to bring the lab into conformance with approved techniques. A review of those suggestions during the Central Kitsap inspection found all suggestions had been implemented.

Split sample results generally compare well (Table 12). The in-plant samples appear representative and analytical results from the two laboratories are comparable. Two areas of some concern were the chlorine residual and the Bangor sample. The Ecology and Central Kitsap colorimetric chlorine residual results compared closely, but the Central Kitsap amperometric results were lower by a factor of ten. The two systems were checked by Central Kitsap after the inspection and minor changes were made to the amperometric system. A recheck of chlorine residual is suggested during a future plant visit. The Navy-Bangor composite sample collected by the STP had a substantially higher TSS concentration than the corresponding Ecology sample. The sampler and intake point should be checked to assure the sample is not biased.

CONCLUSIONS AND RECOMMENDATIONS

General Chemistry and NPDES Permit Parameters

The STP was upset during the inspection resulting in effluent exceeding NPDES permit BOD_5 , TSS, and chlorine residual concentrations. Partial nitrification-denitrification appeared to be occurring, perhaps contributing to the upset condition.

Plant loading was approaching one-half capacity. Operating one-half of the plant (one primary clarifier, two activated sludge basins, and one secondary clarifier) may give useful insight into actual plant capacity.

Navy-Bangor and Navy-Keyport general chemistry parameters were similar to the fairly typical wastewater characteristics of the STP influent. Flow meters at both facilities needed adjustment.

Priority Pollutants - Water and Sludge

Numerous priority pollutants were detected in one or more of the samples collected. Most were found in low concentrations. The data indicate in-plant reduction or removal of most of the parameters observed in the STP influent sample. Several of the parameters detected in the STP influent were not detected in either the Keyport or Bangor samples suggesting the facilities were not the sole source of priority pollutants.

The list of priority pollutants found in the treatment plant samples and those found in the sludge sample are similar, although fewer parameters were detected in the sludge. Similar detection lists suggest the compounds detected in the STP samples are routinely present.

Bioassays - Water

The STP effluent demonstrated some toxicity to rainbow trout (acute) and Microtox. Ammonia was considered a possible cause.

Priority Pollutants - Sediments

All priority pollutants detected in the sediments were in concentrations less than Ecology Interim Sediment Quality Evaluation Process Chemical Criteria; thus, no adverse effects on Puget Sound biological resources would be expected (Ecology, 1989a).

Bioassays - Sediments

The sediments were not toxic to amphipods (Rhepoxynius abronius) or Microtox.

Laboratory Discussion

Procedural recommendations made during a previous lab review approximately a year earlier had all been implemented. Inspection of the Navy-Bangor composite sampler and a recheck of the chlorine residual during a field inspection are recommended.

REFERENCES

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- EPA, 1986. Quality Criteria for Water, EPA 440/5-86-001, May 1, 1986.
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FIGURES

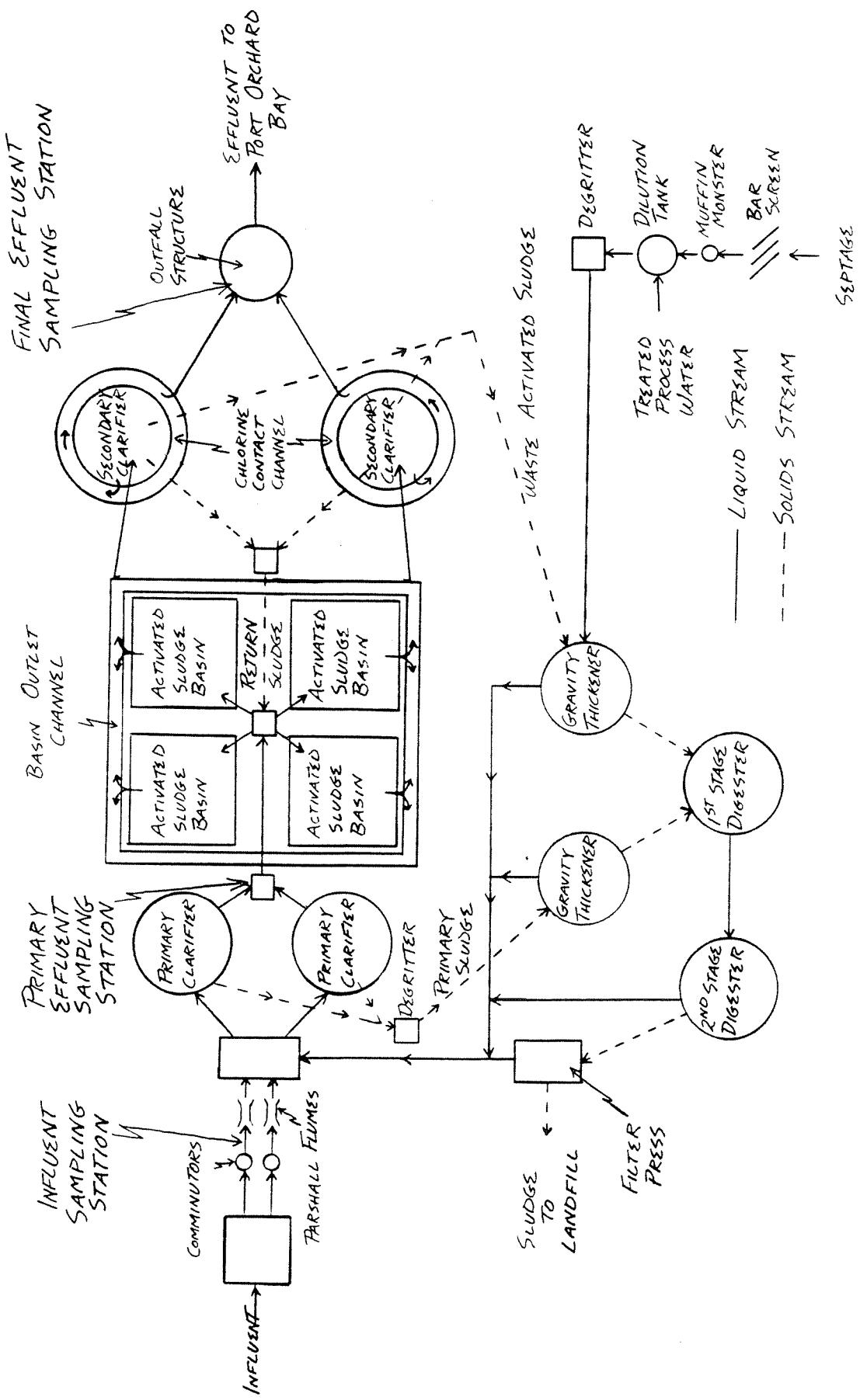


Figure 1 - Flow Scheme - Central Kitsap, November 1988.

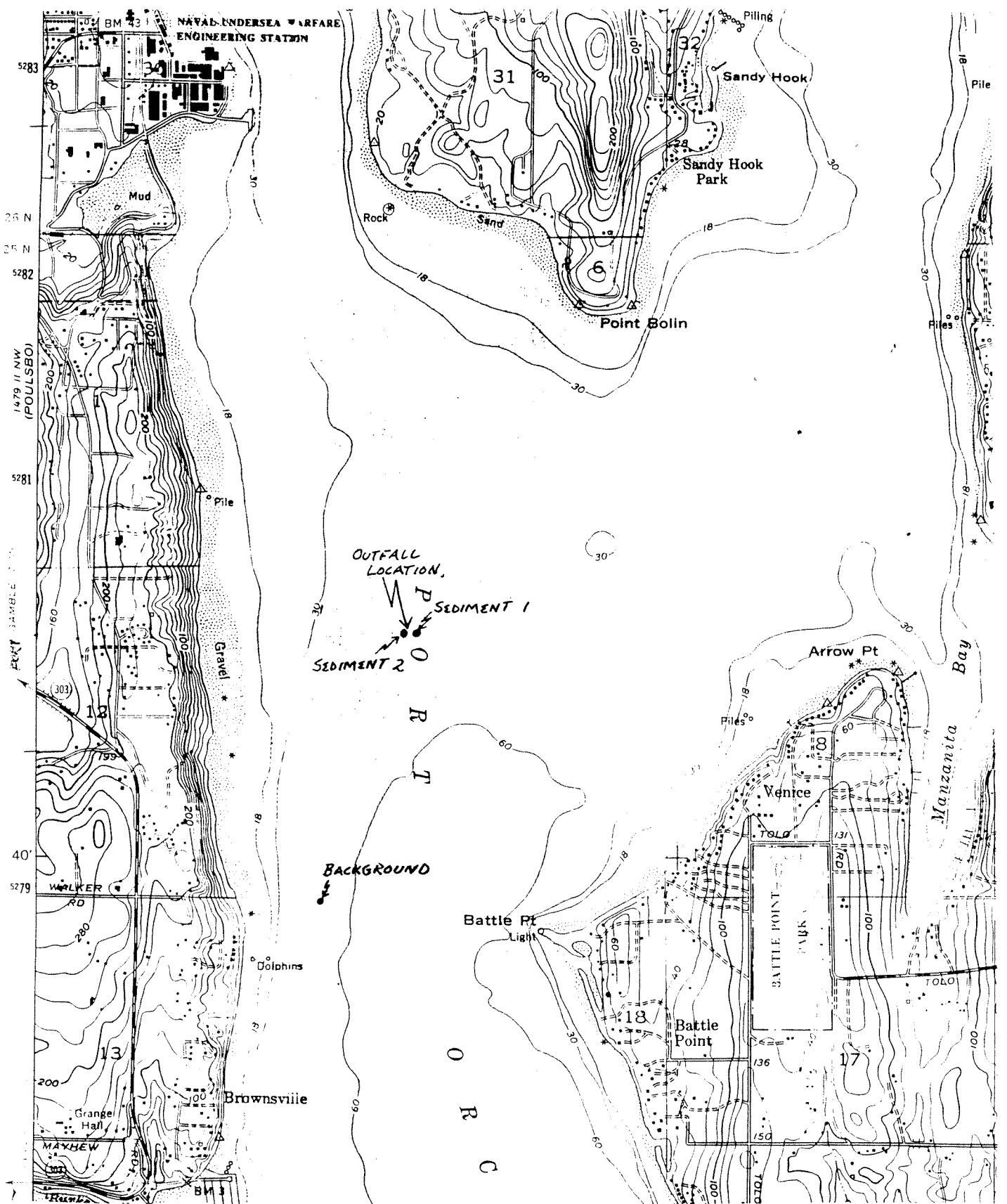


Figure 2 - Sediment Sampling Locations - Central Kitsap, November 1988.

TABLES

Table 1 - Priority Pollutant Cleaning and Field Transfer Blank Procedures
Central Kitsap, November 1988

PRIORITY POLLUTANT SAMPLING EQUIPMENT CLEANING PROCEDURES

1. Wash with laboratory detergent
2. Rinse several times with tap water
3. Rinse with 10 percent HNO₃ solution
4. Rinse three (3) times with distilled/deionized water
5. Rinse with high purity methylene chloride
6. Rinse with high purity acetone
7. Allow to dry and seal with aluminum foil

FIELD TRANSFER BLANK PROCEDURE

1. Pour organic free water directly into appropriate bottles for parameters to be analyzed from grab samples (VOA).
2. Run approximately 1L of organic free water through a compositor and discard.
3. Run approximately 6L of organic free water through the same compositor and put the water into appropriate bottles for parameters to be analyzed from composite samples (BNA, Pesticide/PCB, and metals).

Table 2 - Sampling Schedule - Central Kitsap, November 1988.

	ECOLOGY GRAB SAMPLES					
	Influent	Influent	Pri-Eff	Pri-Eff	Final-Eff	Final-Eff
Station:			11/29	11/29	11/29	11/29
Date:	11/29		11/30	11/30	11/29	11/30
Time:	1020	1615	0925	1010	1635	1700
Type:	Grab	Grab	Grab	Grab	Grab	Grab
Lab Log #:	498230	498231	498232	498233	498234	498235
<hr/> -----Field Analyses-----						
pH	E	E	E	E	E	E
Conductivity	E	E	E	E	E	E
Temperature	E	E	E	E	E	E
Chlorine Residual						
Free						
Total					E	E
<hr/> -----Laboratory Analyses-----						
Turbidity						
Conductivity						
Alkalinity						
Hardness						
NH ₃ -N						
NO ₃ ⁺ +NO ₂ ⁻ -N						
Total-P						
TS						
TN/VS						
TSS	E	E		E	E	E
TN/VS						
COD	E	E		E	E	E
BOD ₅						
Inh ₅ b. BOD ₅						
Fecal Coliform						
TOC						
% Solids						
Grain Size						
Cyanide						
VOA						
BNA						
Pest./PCB						
PP metals						
Trout						
Daphnia Magna						
Microtox						
Rheo. Abr.						
<hr/> E - Ecology Laboratory Analysis						
S - STP Laboratory Analysis						
* - Cd, Cr, Cu, Pb, Ni, and Zn analyzed by the STP for all stations. Hg also analyzed at the Influent, Pri-Ef, and Final-Ef stations.						
** - Grab composite sample. Equal volumes collected on 11/29 at 1005, on 11/29 at 1700, and on 11/30 at 0845.						
*** - The composite sampler failed so a grab sample had to be collected. Field lab log numbers 498238 and 498252 are both grab samples collected at approximately the same time. All data are reported as lab log number 498238.						
+ - Blank sample collection is explained in Table 1.						
++ - sample collected after the filter press						

Table 2 (Continued)

		ECOLOGY GRAB SAMPLES					
Station:	Navy-Key	Navy-Key	Navy-Ban	Navy-Ban	AS	Sludge	Blank
Date:	11/29	11/30	11/29	11/30	11/29	11/29	11/29
Time:	1400	1225	1130	1515	1135	1645	1040
Type:	Grab	Grab	Grab	Grab	Grab	Grab	0900
Lab Log #:	498237	498238	498239	498240	498241	498242	498243
							498254
-----Field Analyses-----							
pH	E	E	E	E	E	E	
Conductivity	E	E	E	E	E	E	
Temperature	E	E	E	E	E	E	
Chlorine Residual							
Free							
Total							
-----Laboratory Analyses-----							
Turbidity	E	E	E	E	E	E	
Conductivity							
Alkalinity							
Hardness							
NH ₃ -N							
NO ₃ +NO ₂ -N							
Total-P							
TS							
TNVS	E	E	E	E	E	E	
TSS	E	E	E	E	E	E	
TNVSS	E	E	E	E	E	E	
COD							
BOD ₅							
Inhb. BOD ₅							
Fecal Coliform							
TOC							
% Solids							
Grain Size							
Cyanide	E	E	E	E	E	E	
VOA	E	E	E	E	E	E	
BNA							
Pest/PCB							
pp metals							
Trout							
Daphnia Magna							
Microtox							
Rhep. Abr.							

E - Ecology Laboratory Analysis

S - STP Laboratory Analysis

* - Cd, Cr, Cu, Pb, Ni, and Zn analyzed by the STP for all stations. Hg also analyzed at the Influent, Pri-Ef, and Final-Ef stations.

** - Grab composite sample. Equal volumes collected on 11/29 at 1005, on 11/29 at 1700, and on 11/30 at 0845.

*** - The composite sampler failed so a grab sample had to be collected. Field lab log numbers 498238 and 498252 are both grab samples collected at approximately the same time. All data are reported as lab log number 498238.

+ - Blank sample collection is explained in Table 1.

++ - sample collected after the filter press

Table 2 (Continued)

Station:	COMPOSITE SAMPLES										SEDIMENT SAMPLES			
	Influent	Influent	Pri-Ef	Final-Ef	Navy-Key	Navy-Ban	Navy-Ban	Sed 1	Sed 2	Sed 3	Eco	Eco	Eco	Eco
Sampler:	Eco	STP	Eco	STP	Eco	STP	Eco	STP	Eco	Eco				
Date:	11/29-30	11/29-30	11/29-30	11/29-30	11/29-30	11/29-30	11/29-30	11/29-30	11/29-30	11/28				
Date:	0930-0930	0930-0930	0930-0930	0930-0930	0930-0930	0930-0930	0930-0930	0930-0930	0930-0930	11/28				
Time:														
Type:	Comp.	Comp.	Comp.	Comp.	Comp.	Grab ***	Comp.	Comp.	Comp.	Comp.	1440-1500	1530-1540	1615-1630	
Lab Log #:	498247	498248	498249	498250	498251	498238	498253	498253	498244	498245				
-----Field Analyses-----														
pH	E	E	E	E	E	E	E	E	E	E				
Conductivity	E	E	E	E	E	E	E	E	E	E				
Temperature	E	E	E	E	E	E	E	E	E	E				
Chlorine Residual														
Free														
Total														
-----Laboratory Analyses-----														
Turbidity	E	E	E	E	E	E	E	E	E	E				
Conductivity	E	E	E	E	E	E	E	E	E	E				
Alkalinity	E	E	E	E	E	E	E	E	E	E				
Hardness	E	E	E	E	E	E	E	E	E	E				
NH3-N	E S	E S	E S	E S	E S	E S	E S	E S	E S	E S				
NO3+NO2-N	E	E	E	E	E	E	E	E	E	E				
Total-P	E	E	E	E	E	E	E	E	E	E				
TS	E	E	E	E	E	E	E	E	E	E				
TNVS	E	E	E	E	E	E	E	E	E	E				
TSS	E S	E S	E S	E S	E S	E S	E S	E S	E S	E S				
TNVS	E	E	E	E	E	E	E	E	E	E				
COD	E	E	E	E	E	E	E	E	E	E				
BOD5	E S	E S	E S	E S	E S	E S	E S	E S	E S	E S				
Inhib. BOD5	E	E	E	E	E	E	E	E	E	E				
Fecal Coliform														
TOC														
% Solids														
Grain Size														
Cyanide	E	E	E	E	E	E	E	E	E	E				
VOA														
BNA	E	E	E	E	E	E	E	E	E	E				
Pest/PCB	E	E	E	E	E	E	E	E	E	E				
pp metals	E S *	E S *	E S *	E S *	E S *	E S *	E S *	E S *	E S *	E S *				
Trout														
Daphnia Magna														
Microtox														
Rhep. Abt.														

E - Ecology Laboratory Analysis

S - STP Laboratory Analysis

* - Cd, Cr, Cu, Pb, Ni, and Zn analyzed by the STP for all stations. Hg also analyzed at the Influent, Pri-Ef, and Final-Ef stations.

** - Grab composite sample. Equal volumes collected on 11/29 at 1005, on 11/29 at 1700, and on 11/30 at 0845.

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+ - Blank sample collection is explained in Table 1.

++ - sample collected after the filter press

Table 3 - Ecology Analytical Methods - Central Kitsap, November 1988.

	Method Used for Ecology Analysis (Ecology, 1988&89)	Laboratory Performing Analysis
---Laboratory Analyses---		
Turbidity	EPA #180.1	Ecology
Conductivity	EPA #120.1	Ecology
Alkalinity	EPA #310.1	Ecology
Hardness	EPA #130.2	Ecology
NH ₃ -N	EPA #350.1	Ecology
NO ₃ +NO ₂ -N	EPA #353.1	Ecology
Total-P	EPA #365.1	Ecology
TS	EPA #160.3	Ecology
TNVS	EPA #160	Ecology
TSS	EPA #160.2	Ecology
TNVSS	EPA #160	Ecology
COD	EPA #410.1	Ecology
BOD ₅	EPA #405.1	Ecology
Inhib. BOD ₅	EPA #405	Ecology
Fecal Coliform	APHA ,1985: #909C	Ecology
TOC	Tetra Tech, 1986	Laucks
% Solids	EPA #160.3	Laucks
Grain Size	Tetra Tech, 1986	Laucks
Cyanide	EPA #335.3	Ecology
VOA (water)	EPA #624	ARI
VOA (sediment)	EPA #8240	ARI
BNA (water)	EPA #625	ARI
BNA (sediment)	EPA #8270	ARI
Pest/PCB (water)	EPA #608	ARI
Pest/PCB (sediment)	EPA #8080	ARI
pp metals	EPA #200	Ecology
Trout	Ecology, 1981	Biomed
Daphnia Magna	EPA, 1987	Ecology
Microtox (water)	Beckman, 1982	Ecology
Microtox (sediment)	Tetra Tech, 1986	Ecology
Rhep. Abr.	Tetra Tech, 1986	Ecology
---Field Analyses-----		
pH	APHA, 1985: #423	
Conductivity	APHA, 1985: #205	
Temperature	APHA, 1985: #212	
Chlorine Residual	APHA, 1985: #408E	

ARI - Analytical Resources Inc.
 Biomed - Biomed Research Laboratories, Inc.
 Laucks - Laucks Testing Laboratories, Inc.

Table 4 - Ecology General Chemistry Results - Central Kitsap, November 1988.

ECOLOGY GRAB SAMPLES											
Station:	Influent	Influent	Pri-EF	Pri-EF	Final-EF	Final-EF	Final-EF	Navy-Key	Navy-Ban	AS	Blank
Date:	11/29	11/29	11/29	11/29	11/30	11/29	11/30	11/29	11/30	11/29	11/29
Time:	1020	1615	0925	1010	1635	0930	1005	1315	1400	1515	1645
Type:	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	0900
Lab Log #:	498230	498231	498232	498233	498234	498235	498236	498237	498238	498239	498240
--Field Analyses--											498242
pH (S.U.)	6.8	6.7	6.8	6.9	6.8	6.9	7.1	7.2	7.6	8.6	7.0
Conductivity (umhos/cm)	658	930	960	1240	1110	880	760	780	520	920	1142
Temperature (C)	14.4	14.9	14.0	15.2	12.8	13.0	14.0	12.8	320	13.6	15.6
Chlorine Residual											
Free (mg/L)											
Total (mg/L)											
--Laboratory Analyses--											
Conductivity (umhos/cm)											
TSS (mg/L)	96	160	1340		1300	1070		920		1000	1830
TNVS (mg/L)					54	68		23		160	130
COD (mg/L)								4			2000
Fecal Coliform (#/100mL)	360	580		390	320			59	40	360	540
Cyanide (ug/L)								6	11	430	680
									14	12	56
										66	56

COMPOSITE SAMPLES											
Station:	Influent	Influent	Pri-EF	Pri-EF	Final-EF	Final-EF	Final-EF	Navy-Key	Navy-Ban	AS	Blank
Sampler:	Eco	STP	Eco	Eco	STP	STP	STP	Eco	Eco	Eco	
Date:	11/29-30	11/29-30	11/29-30	11/29-30	11/29-30	11/29-30	11/29-30	11/29-30	11/29-30	11/29-30	
Time:	0930-0930	0930-0930	0930-0930	0930-0930	0930-0930	0930-0930	0930-0930	0930-0930	0930-0930	0930-0930	
Type:	Comp.										
Lab Log #:	498247	498248	498249	498250	498251	498251	498251	498251	498251	498251	498253
--Field Analyses--											
pH (S.U.)	7.1		7.0	7.3							7.0
Conductivity (umhos/cm)	760		880	750							1710
Temperature (C)	2.4		4.4	2.1							3.6
--Laboratory Analyses--											
Turbidity (NTU)											
Conductivity (umhos/cm)	28		53	31							
Alkalinity (mg/L as CaCO ₃)	1000		980	1060							
Hardness (mg/L as CaCO ₃)	210		180	210							
NH ₃ -N (mg/L)	120		110	110							
NO ₃ +NO ₂ -N (mg/L)	25		23	34							
Total-P (mg/L)	0.09		0.01	0.06							
TS (mg/L)	6.6		7.2	6.7							
TNVS (mg/L)	730		650	510							
COD (mg/L)	420		380	400							
BOD ₅ (mg/L)	160		200	72							
Inhlt. BOD ₅ (mg/L)	18		32	14							
Cyanide (ug/L)	510		450	340							
BOD ₅ (mg/L)	200		180	160							
Inhlt. BOD ₅ (mg/L)	170		180	140							
Cyanide (ug/L)	8		10	14							

**** - The composite sampler failed so a grab sample had to be collected.
 Field lab log numbers 498238 and 498252 are both grab samples collected
 at approximately the same time. All data are reported as lab log
 number 498238.

P - greater than

Table 5 - Comparison of Inspection Results with NPDES Permit Limits - Central Kitsap, November 1988.

Parameter	NPDES Permit			Inspection Data *		
	Limits	Capacity		Ecology	STP	Grab
	Monthly Average	Weekly Average	(average for max month)	Composite	Composite	Samples
Influent BOD ₅ (mg/L) (lbs/D)			10700	200 3836	180 3453	
Effluent BOD ₅ (mg/L) (lbs/D) (% removal)	30 1200 85	45 1800		68 1304 66	67 1285 63	
Influent TSS (mg/L) (lbs/D)			13400	160 3069	200 3836	
Effluent TSS (mg/L) (lbs/D) (% removal)	30 1200 85	45 1800		34 652 79	39 748 81	
Fecal coliform (#/100 mL)	200	400				6; 11
pH (S.U.)	not outside range of 6.0 - 9.0					7.1; 6.9; 7.2
Flow (MGD)			4.8	2.3	2.3	
Chlorine Residual (mg/L)	0.25 maximum					0.8; 0.6

* Ecology analytical results except for effluent BOD5 which are Central Kitsap analytical results.

Table 6 - Flow Measurements - Central Kitsap, November 1988.

BANGOR - 12" Parshall flume

Date		Time	Totalizer reading	Instantaneous Flow (MGD)		Flow for time increment (MGD)
Month	Day			Meter	Ecology	
11	29	1150	350142	0.40	0.69	
11	30	1115	371947	1.7	0.69	2.23

Meter appeared inaccurate:
Average inspection flow unknown

KEYPORT - 3" Parshall flume

Date		Time	Totalizer reading	Instantaneous Flow (MGD)		Flow for time increment (MGD)
Month	Day			Meter	Ecology	
11	29	1400	7090954	0.22	0.17	
11	30	1205	7393151	0.19	0.12	0.33

Meter appeared to be approximately 30% too high:
Estimated average inspection flow rate - 0.23 MGD

CENTRAL KITSAP - two 18" Parshall flumes

Date		Time	Flume	Instantaneous Flow (MGD)	
Month	Day			Meter	Ecology
11	30	1030	East	1.35	1.34
			West	1.68	1.68

Average inspection flow (from plant meter) = 2.3 MGD

Table 7 - Priority Pollutants Detected in Water and Sludge Samples - Central Kitsap, November, 1988.

Station:	Field	Blank	Navy-Key	Navy-Ban	Influent	Pri-EF	Final-EF	Freshwater
	Date:	11/29	11/30	11/29	11/30	11/29	11/30	Sludge
Time:	0900	1400	1225	1515	1135	1615	0950	(EA, 1986)
Lab Log #:	498237	498238	498239	498240	498230	498232	498234	498235
-VOA Compounds (ug/L) --								(ug/Kg dry wt)
Chloromethane	2.9	U	-	-	-	2.3 M	5.0	6.7
Methylene Chloride	2.8	B	11 B	5.2 B	1.1 B	2.4 B	3.1 B	3.2 B
Acetone	14	B	130 B	140 B	51 B	34 B	110 B	92 B
Carbon Disulfide	2.0	U	-	-	-	4.9	7.8	3.3
Cis-1,2-Dichloroethene	1.2	U	-	-	-	1.1 J	0.7 J	0.6 J
Chloroform	0.9	U	20	8.5	11	9.2	6.8	6.9
2-Butanone	1.0	U	-	-	-	4.6	5.2	-
1,2-Dichloroethane	0.6	U	-	-	2.4	2.6	0.7 M	-
1,1,1-Trichloroethane	1.0	U	2.1	1.1	1.3	2.2	0.9 M	1.2 M
Bromodichloromethane	0.2	U	0.4	0.6	11	3.7	2.1	0.4
Trichloroethene	0.8	U	5.0	4.5	-	3.3	2.1	2.0
Benzene	0.4	U	-	-	55	70	21	16
Dibromochloromethane	0.9	U	-	-	3.2	0.7 J	0.8 J	-
Tetrachloroethene	0.6	U	0.7	-	-	0.4 J	24	69
Toluene	0.8	B	4.5 B	1.9 B	130 B	170 B	52 B	47 B
Chlorobenzene	0.6	U	-	-	-	-	-	-
Ethylbenzene	1.0	U	-	-	12	17	4.3	4.3
Total Xylenes	1.5	U	3.7	3.7	120	170	41	41
Cyanide (ug/L)			14	12	66	56		

+ - LOEL for total dichloroethenes

++ - criteria for total dichlorobenzenes

+++ - total 1,2-Dichloroethene

* - Insufficient data to develop criteria. Value presented is the LOEL - Lowest Observed Effect Level.

** - penta(tri) - penta concentrations are LOEL

*** - LOEL for chlorinated benzenes

+* - Benzo(b+k)Fluoranthene

**+ - hex(tri) - tri concentrations based on hardness

+++ - criteria calculation based on hardness

B - This flag is used when the analyte is found in the blank as well as the sample. Indicates possible/probable blank contamination

F - analytical difficulty; may not be accurate

J - indicates an estimated value when result is less than specified detection limit

M - indicates an estimated value of analyte found and confirmed by analyst but with low spectral match parameters

U - indicates compound was analyzed for but not detected at the given detection limit

Table 7 (continued)

Table 8 - Central Kitsap Sludge Metals Comparison - Central Kitsap, November 1988.

Metal	STP** sample (mg/kg dry wt)	Data from previous inspections*		
		Range (mg/kg dry wt)	Geometric mean (mg/kg dry wt)	Number of samples
Cadmium	<5.9	<0.1 - 25	7.6	34
Chromium	45.6	15 - 300	62	34
Copper	637	75 - 1700	398	34
Lead	140	34 - 600	207	34
Nickel	38.4	<0.1 - 62	26	29
Zinc	16.3F	165 - 3370	1200	33

* Summary of data for digested activated sludge plant samples collected during previous Class II inspections in the state (Hallinan, 1988).

** percent solids = 26.9%

F - analytical difficulty; may not be accurate

Table 9 - Effluent Bioassay Results - Central Kitsap, November 1988

Daphnia (Daphnia magna)

Sample	Statistical Analysis	Concen-tration (percent)	Data			Ave. # Young per Adult**
			# Tested	# Surviving	Young per Adult	
Control		-	10	10		1.7
STP Effluent	Acute Test (Mortality)	1	10	10		0.9
	NOEC - 100%	3	10	10		0.5
	LC50 - >100%	10	10	10		1.2
	Chronic Test (Reproduction)	30	10	10		0.3
	**	100	10	9		4.5

** Use of the reproduction data is not recommended (Stinson, 1989).

Poor reproduction was observed in all tests including the control. Shortly after the test the stock culture was lost. Upon checking with other labs, loss of stock cultures during that time period was common leading to the suspicion that a seasonal problem was occurring.

Microtox

Sample	EC50 (percent solution) *		
	5 min.	15 min.	30 min.
STP Effluent **	35.2	25.7	24.5

* - calculated using Microbics "Microtox Calculation Program for the IBM-PC"

** - EC50s indicate need for further toxicity evaluation is a moderate priority (EPA, 1980)

Rainbow Trout (Oncorhynchus mykiss)

Sample	# Tested	# Survived	Percent Mortality	Percent Survival
Control	45	45	0	100
100% STP Effluent	30	22	27	73

NOEC - no observable effects concentration

LOEC - lowest observable effects concentration

LC50 - lethal concentration for 50% of the organisms

EC50 - effect concentration for 50% of the organisms

Table 10 - Priority Pollutants Detected in Sediments - Central Kitsap, November 1988.

Station:	Sed-1	Sed-2	Background	Draft ***
Date:	11/28	11/28	11/28	Interim
Time:	1440-1500	1530-1540	1615-1630	Sediment
Lab Log #:	498244	498245	498246	Criteria
Number of grabs	2	2	2	
Sample depth (ft)	52-51	51-52	45-47	
Latitude (deg-min-sec)	47-40-35	47-40-35	47-39-54	
Longitude (deg-min-sec)	122-36-04	122-36-06	122-36-25	
Total solids (%)	35.2	35.2	33.9	
Grain size (% dry basis)				
Sand	7.7	7.8	10.5	
Silt	69.2	71.7	66.4	
Clay	23.1	20.5	23.1	
TOC (% dry basis)	2.1	1.8	2.1	
	(mg/Kg TOC)*+	(mg/Kg TOC)*+	(mg/Kg TOC)*+	
----- VOA Compounds (ug/Kg dry wt) -----				
Methylene Chloride	5.6 J	9.9 U	10 U	
Toluene	2.3	2.0 U	2.1 U	
Ethylbenzene	2.1	2.0 U	2.1 U	
----- BNA Compounds (ug/Kg dry wt) -----				
Low Molecular Weight Polynuclear Aromatic Hydrocarbons (LPAH)				
Phenanthrene	20 J	1.0 J	17 J	0.9 J
LPAH (total)		1.0 J		0.9 J
High Molecular Weight Polynuclear Aromatic Hydrocarbons (HPAH)				
Fluoranthene	45	2.1	45	2.5
Pyrene	45	2.1	43	2.4
Benzo(a)Anthracene	21 J	1.0 J	20 J	1.1 J
Chrysene	27	1.3	25 J	1.4 J
Benzo(b+k)Fluoranthene	46	2.2	43	2.4
Benzo(a)Pyrene	24 J	1.1 J	22 J	1.2 J
Indeno(1,2,3-cd)Pyrene	31	1.5	26	1.4
Benzo(g,h,i)Perylene	26 U	1.2 U	19 M	1.1 M
HPAH (total)		12.6		13.5
Phthalate Esters				
Di-n-Butyl Phthalate	26 U	1.2 U	26 U	1.4 U
Bis(2-Ethylhexyl)phthalate	35	1.7	85	4.7
----- Pest/PCB Compounds (ug/Kg dry wt) -----				
Aroclor-1254	25	1.2	23	1.3
----- Priority pollutant metals (mg/Kg dry wt) -----				
Arsenic	9.31		9.72	8.78
Beryllium	0.58		0.55	0.65
Chromium	79.4		59.6	48.2
Copper	44.9		44.7	44.4
Lead	34		34	34.9
Mercury	0.24		0.27	0.29
Nickel	48.9		42.0	39.8
Selenium	0.67		0.61	0.56
Silver	0.52		0.51	0.37
Thallium	0.27		0.10 U	0.13
Zinc	102 F		102 F	105 F
				410

B - This flag is used when the analyte is found in the blank as well as the sample. Indicates possible/probable blank contamination.

F - Analytical difficulty; may not be accurate.

J - Indicates an estimated value when result is less than specified detection limit.

M - Indicates an estimated value of analyte found and confirmed by analyst but with low spectral match parameters.

U - Indicates compound was analyzed for but not detected at the given detection limit.

UJ - Compound was analyzed for but not detected. The number is the estimated minimum detection limit.

* - Sediment criteria normalized to TOC (mg/Kg TOC).

** - Draft Interim Sediment Quality Chemical Criteria (Ecology, 1989a) Criteria are in the same units as the compound or element unless otherwise noted.

*+ - Data converted to mg/KG TOC for comparison to sediment criteria.

++ - Criteria for total PCBs.

Table 11 - Sediment Bioassay Results - Central Kitsap, November 1988

Amphipod - (*Rhepoxynius abronius*)

<u>Station</u>	<u>% survival *</u>
Control	98%
Sediment 1	94%
Sediment 2	89%
Background	94%

* average of 5 replicates of 20 organisms each.

Microtox

<u>Station</u>	<u>EC50 *</u>
Sediment 1	> 100%
Sediment 2	> 100%
Background	> 100%

* EC50 - effect concentration for 50% of the organisms

Table 12 - Comparison of Ecology and STP Laboratory Results - Central Kitsap, November 1988.

Station:	Influent	Influent	Pri-Eff	Pri-Eff	Final-Eff	Navy-Ban	Navy-Ban	Navy-Key										
Lab Log #:	498247	498248	498249	498250	498251	498253	498255	498256	498257	498258	498259	498260	498261	498262	498263	498264	498265	
Type:	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	
Sampler:	Eco	Eco	Eco	Eco	Eco	Eco	Eco	Eco	Eco	Eco	Eco	Eco	Eco	Eco	Eco	Eco	Eco	
Lab:	Eco	STP	Eco	STP	Eco	STP	Eco	STP	Eco	STP	Eco	STP	Eco	STP	Eco	STP	Eco	
NH ₃ -N (mg/L)	25	21.2	23	19.9	34	32.7	22	18.3	19	15.3								
TSS (mg/L)	160	156	200	176	72	60	34	26	39	14								
BOD ₅ (mg/L)	200	265	180	218	160	164	60	68	58	P								
Inhib. BOD (mg/L)																		
F. Coli. (#/100mL)																		
Cadmium (ug/L)	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	
Chromium (ug/L)	10 U	25 U	10 U	25 U	10 U	25 U	10 U	25 U	10 U	25 U	10 U	25 U	10 U	25 U	10 U	25 U	10 U	
Copper (ug/L)	53	4.8			4.8		4.5		16		21					124	164	56
Lead (ug/L)	11		50 U		8		50 U		3 U		50 U		15		50 U	9	50 U	59
Nickel (ug/L)	11	25 U			11	25 U		10 U		25 U		15		25 U	12	25 U	25 U	
Zinc (ug/L)	121	168			107	69	55	63					158	294	207	179		
Mercury (ug/L)	0.867B	0.64			0.869B	0.64	0.083B	0.29										
Cl ₂ Residual (mg/L)																		
Colorimetric																		
Amperometric																		

U - Indicates compound was analyzed for but not detected at the given detection limit.

B - This flag is used when the analyte is found in the blank as well as the sample. Indicates possible/probable blank contamination.

P - Greater than.

** - Both samples collected 11/29 - AM.

APPENDICES

Appendix A - Results of VOA, BNA, Pest/PCB and metal priority pollutant scans
of sediment samples and sludge - Central Kitsap, November 1988.

Station:	Sed-1	Sed-2	Background	Sludge	Method Blank
Date:	11/28	11/28	11/28	11/29	
Time:	1440-1500	1530-1540	1615-1630	1040	
Lab Log #:	498244	498245	498246	498243	
Number of grabs	2	2	2		
Sample depth (ft)	52-51	51-52	45-47		
Latitude (deg-min-sec)	47-40-35	47-40-35	47-39-54		
Longitude (deg-min-sec)	122-36-04	122-36-06	122-36-25		
Total solids (%)	35.2	35.2	33.9	26.9	
Grain size (% dry basis)					
Sand	7.7	7.8	10.5	14.1	
Silt	69.2	71.7	66.4	<0.5	
Clay	23.1	20.5	23.1	85.9	
TOC (% dry basis)	2.1	1.8	2.1	30	
----- VOA Compounds (ug/Kg dry wt) -----					
Chloromethane	10 U	9.7 U	10 U	300	3.8 U
Bromomethane	8.0 U	7.9 U	8.2 U	48 U	3.1 U
Vinyl Chloride	5.2 U	5.1 U	5.3 U	31 U	2.0 U
Chloroethane	8.5 U	8.4 U	8.8 U	52 U	3.3 U
Methylene Chloride	5.6 J	9.9 U	10 U	591	3.9 U
Acetone	18 U	18 U	18 U	3200	6.9 U
Carbon Disulfide	3.1 U	3.1 U	3.2 U	19 U	1.2 U
1,1-Dichloroethene	1.8 U	1.8 U	1.9 U	11 U	0.7 U
1,1-Dichloroethane	1.6 U	1.5 U	1.6 U	9.4 U	0.6 U
1,2-Dichloroethene (total)	2.1 U	2.0 U	2.1 U	56	0.8 U
Chloroform	2.8 U	2.8 U	2.9 U	17 U	1.1 U
2-Butanone	16 U	16 U	17 U	97 U	6.2 U
1,2-Dichloroethane	1.3 U	1.3 U	1.3 U	7.8 U	0.5 U
1,1,1-Trichloroethane	1.6 U	1.5 U	1.6 U	9.4 U	0.6 U
Carbon Tetrachloride	2.3 U	2.3 U	2.4 U	14 U	0.9 U
Vinyl Acetate	8.0 U	7.9 U	8.2 U	48 U	3.1 U
Bromodichloromethane	0.8 U	0.8 U	0.8 U	4.7 U	0.3 U
1,2-Dichloropropane	1.8 U	1.8 U	1.9 U	11 U	0.7 U
Trichloroethene	1.6 U	1.5 U	1.6 U	9.4 U	0.6 U
Benzene	2.6 U	2.6 U	2.7 U	37	1.0 U
Dibromochloromethane	1.8 U	1.8 U	1.9 U	11 U	0.7 U
1,1,2-Trichloroethane	1.8 U	1.8 U	1.9 U	11 U	0.7 U
Bromoform	6.5 U	6.4 U	6.6 U	39 U	2.5 U
4-Methyl-2-Pentanone	9.1 U	8.9 U	9.3 U	55 U	3.5 U
2-Hexanone	8.3 U	8.2 U	8.5 U	50 U	3.2 U
1,1,2,2-Tetrachloroethane	7.0 U	6.9 U	7.2 U	42 U	2.7 U
Tetrachloroethene	1.3 U	1.3 U	1.3 U	7.8 U	0.5 U
Toluene	2.3	2.0 U	2.1 U	3700	0.8 U
Chlorobenzene	2.3 U	2.3 U	2.4 U	2200	0.9 U
trans-1,3-Dichloropropene	4.9 U	4.8 U	5.1 U	30 U	1.9 U
Ethylbenzene	2.1	2.0 U	2.1 U	280	0.8 U
cis-1,3-Dichloropropene	4.7 U	4.6 U	4.8 U	28 U	1.8 U
Styrene	2.8 U	2.8 U	2.9 U	17 U	1.1 U
Total Xylenes	4.7 U	4.6 U	4.8 U	2100	1.8 U
2-Chloroethylvinylether	7.0 U	6.9 U	7.2 U	42 U	2.7 U

Appendix A (Continued)

Station:	Sed-1	Sed-2	Background	Sludge	Method	Blank
Date:	11/28	11/28	11/28	11/29		
Time:	1440-1500	1530-1540	1615-1630	1040		
Lab Log #:	498244	498245	498246	498243		
<hr/> BNA Compounds (ug/Kg dry wt) <hr/>						
Phenol	26 U	26 U	39 U	2100 M	17 U	
Aniline						
Bis(2-Chloroethyl)Ether	26 U	26 U	39 U	820 U	17 U	
2-Chlorophenol	26 U	26 U	39 U	820 U	17 U	
1,3-Dichlorobenzene	26 U	26 U	39 U	820 U	17 U	
1,4-Dichlorobenzene	26 U	26 U	39 U	1100 M	17 U	
Benzyl Alcohol	130 U	130 U	200 U	4100 U	80 U	
1,2-Dichlorobenzene	26 U	26 U	39 U	820 U	17 U	
2-Methylphenol	26 U	26 U	39 U	820 U	17 U	
Bis(2-chloroisopropyl)ether	26 U	26 U	39 U	820 U	17 U	
4-Methylphenol	26 U	26 U	39 U	1500 M	17 U	
N-Nitroso-Di-n-Propylamine	26 U	26 U	39 U	820 U	17 U	
Hexachloroethane	50 U	50 U	80 U	1600 U	30 U	
Nitrobenzene	26 U	26 U	39 U	820 U	17 U	
Isophorone	26 U	26 U	39 U	820 U	17 U	
2-Nitrophenol	130 U	130 U	200 U	4100 U	80 U	
2,4-Dimethylphenol	50 U	50 U	80 U	1600 U	30 U	
Benzoic Acid	260 U	260 U	390 U	8200 U	170 U	
Bis(2-Chloroethoxy)Methane	26 U	26 U	39 U	820 U	17 U	
2,4-Dichlorophenol	80 U	80 U	120 U	2400 U	50 U	
1,2,4-Trichlorobenzene	26 U	26 U	39 U	820 U	17 U	
Naphthalene	26 U	26 U	39 U	7000	17 U	
4-Chloroaniline	26 U	80 U	120 U	2400 U	50 U	
Hexachlorobutadiene	50 U	50 U	80 U	1600 U	30 U	
4-Chloro-3-Methylphenol	50 U	50 U	80 U	1600 U	30 U	
2-Methylnaphthalene	26 U	26 U	39 U	6300	17 U	
Hexachlorocyclopentadiene	130 U	130 U	200 U	4100 U	80 U	
2,4,6-Trichlorophenol	130 U	130 U	200 U	4100 U	80 U	
2,4,5-Trichlorophenol	130 U	130 U	200 U	4100 U	80 U	
2-Choronaphthalene	26 U	26 U	39 U	820 U	17 U	
2-Nitroaniline	130 U	130 U	200 U	4100 U	80 U	
Dimethyl Phthalate	26 U	26 U	39 U	820 U	17 U	
Acenaphthylene	26 U	26 U	39 U	820 U	17 U	
3-Nitroaniline	130 U	130 U	200 U	4100 U	80 U	
Acenaphthene	26 U	26 U	39 U	2000	17 U	
2,4-Dinitrophenol	260 U	260 U	390 U	8200 U	170 U	
4-Nitrophenol	130 U	130 U	200 U	4100 U	80 U	
Dibenzofuran	26 U	26 U	39 U	820 U	17 U	
2,4-Dinitrotoluene	130 U	130 U	200 U	4100 U	80 U	
2,6-Dinitrotoluene	130 U	130 U	200 U	4100 U	80 U	
Diethyl Phthalate	26 U	26 U	39 U	820 U	17 U	
4-Chlorophenyl-Phenylether	26 U	26 U	39 U	820 U	17 U	
Fluorene	26 U	26 U	39 U	1500	17 U	
4-Nitroaniline	130 U	130 U	200 U	4100 U	80 U	
4,6-Dinitro-2-Methylphenol	260 U	260 U	390 U	8200 U	170 U	
N-Nitrosodiphenylamine	26 U	26 U	39 U	820 U	17 U	
1,2-Diphenylhydrazine						
4-Bromophenyl-Phenylether	26 U	26 U	39 U	820 U	17 U	

Appendix A (Continued)

Station:	Sed-1	Sed-2	Background	Sludge	Method	Blank
Date:	11/28	11/28	11/28	11/29		
Time:	1440-1500	1530-1540	1615-1630	1040		
Lab Log #:	498244	498245	498246	498243		
Hexachlorobenzene	26 U	26 U	39 U	820 U	17 U	
Pentachlorophenol	130 U	130 U	200 U	4100 U	80 U	
Phenanthrene	20 J	17 J	56 J	5700	17 U	
Anthracene	26 U	26 U	39 U	510 M	17 U	
Di-n-Butyl Phthalate	26 U	26 U	46 M	820 U	17 U	
Fluoranthene	45	45	150 U	820 U	17 U	
Pyrene	45	43	97	820 U	17 U	
Benzidine						
Butylbenzylphthalate	26 U	26 U	39 U	1600	17 U	
3,3'-Dichlorobenzidine	129 U	131 U	196 U	4100 U	80 U	
Benzo(a)Anthracene	21 J	20 J	46 M	820 U	17 U	
Chrysene	27	25 J	70 J	820 U	17 U	
Bis(2-Ethylhexyl)phthalate	35	85	120	75000	17 U	
Di-n-Octyl Phthalate	26 U	26 U	39 U	3900	17 U	
Benzo(b)Fluoranthene				820 U	17 U	
Benzo(k)Fluoranthene	46 *	43 *	120 *	820 U	17 U	
Benzo(a)Pyrene	24 J	22 J	67	820 U	17 U	
Indeno(1,2,3-cd)Pyrene	31	26	53 M	820 U	17 U	
Dibenzo(a,h)Anthracene	26 U	26 U	39 U	820 U	17 U	
Benzo(g,h,i)Perylene	26 U	19 M	42 M	820 U	17 U	
----- Pest/PCB Compounds (ug/Kg dry wt) -----						
alpha-BHC	0.4 U	0.4 U	0.6 U	1.2 U	0.5 U	
beta-BHC	0.4 U	0.4 U	0.6 U	1.2 U	0.5 U	
delta-BHC	0.4 U	0.4 U	0.6 U	1.2 U	0.5 U	
gamma-BHC (Lindane)	0.4 U	0.4 U	0.6 U	1.2 U	0.5 U	
Heptachlor	0.4 U	0.4 U	0.6 U	1.2 U	0.5 U	
Aldrin	0.4 U	0.4 U	0.6 U	1.2 U	0.5 U	
Heptachlor Epoxide	0.4 U	0.4 U	0.6 U	1.2 U	0.5 U	
Endosulfan I	1.2 U	1.2 U	1.8 U	3.7 U	1.5 U	
Dieleadrin	0.8 U	0.8 U	1.2 U	2.5 U	1.0 U	
4,4'-DDE	0.8 U	0.8 U	1.2 U	2.5 U	1.0 U	
Endrin	0.8 U	0.8 U	1.2 U	2.5 U	1.0 U	
Endosulfan II	0.8 U	0.8 U	1.2 U	2.5 U	1.0 U	
4,4'-DDD	0.8 U	0.8 U	1.2 U	2.5 U	1.0 U	
Endosulfan Sulfate	0.8 U	0.8 U	1.2 U	2.5 U	1.0 U	
4,4'-DDT	0.8 U	0.8 U	1.2 U	2.5 U	1.0 U	
Methoxychlor	1.5 U	1.6 U	2.3 U	4.9 U	2.0 U	
Endrin Ketone	0.8 U	0.8 U	1.2 U	2.5 U	1.0 U	
alpha-Chlordane	0.8 U	0.8 U	1.2 U	2.5 U	1.0 U	
gamma-Chlordane	0.8 U	0.8 U	1.2 U	2.5 U	1.0 U	
Toxaphene	40 U	40 U	60 U	120 U	50 U	
Aroclor-1016 and 1242	8.0 U	8.0 U	12 U	24 U	10 U	
Aroclor-1221						
Aroclor-1232						
Aroclor-1242						
Aroclor-1248	8.0 U	8.0 U	12 U	24 U	10 U	
Aroclor-1254	25	23	25 UJ	24 U	10 U	
Aroclor-1260-	8.0 U	8.0 U	12 U	24 U	10 U	
Endrin Aldehyde						

Appendix A (Continued)

Station:	Sed-1	Sed-2	Background	Sludge	Method	Blank
Date:	11/28	11/28	11/28	11/29		
Time:	1440-1500	1530-1540	1615-1630	1040		
Lab Log #:	498244	498245	498246	498243		
----- Priority pollutant metals (mg/Kg dry wt) -----						
Antimony	0.60 UJ	0.60 UJ	0.60 UJ	2.7 J		
Arsenic	9.31	9.72	8.78	10.6		
Beryllium	0.58	0.55	0.65	0.26		
Cadmium	2.0 UJ	2.0 UJ	2.0 UJ	5.9 J		
Chromium	79.4	59.6	48.2	45.6		
Copper	44.9	44.7	44.4	637		
Lead	34	34	34.9	140		
Mercury	0.24	0.27	0.29	7.1 J		
Nickel	48.9	42.0	39.8	38.4		
Selenium	0.67	0.61	0.56	7.68		
Silver	0.52	0.51	0.37	74.3		
Thallium	0.27	0.10 U	0.13	0.10 U		
Zinc	102 F	102 F	105 F	16.3 F		

B - This flag is used when the analyte is found in the blank as well as the sample.
Indicates possible/probable blank contamination.

F - Analytical difficulty; may not be accurate.

J - Indicates an estimated value when result is less than specified detection limit.

M - Indicates an estimated value of analyte found and confirmed by analyst but with low spectral match parameters.

U - Indicates compound was analyzed for but not detected at the given detection limit.

UJ - Compound was analyzed for but not detected. The number is the estimated minimum detection limit.

* - Benzo(b+k)Fluoranthene.

Appendix B - Results of VOA, BNA, Pest/PCB and metal priority pollutant scans of water samples - Central Kitsap, November 1988.

	Station:	Influent	Influent	Pri-Eff	Pri-Eff	Final-Eff	Final-Eff	Navy-Key	Navy-Key	Navy-Ban	Navy-Ban	Field Blank
	Date:	11/29	11/30	11/29	11/30	11/29	11/30	11/29	11/30	11/29	11/29	
	Time:	1615	0925	1635	0950	1700	0845	1400	1225	1515	1135	0900
	Lab Log #:	498230	498231	498232	498233	498234	498235	498237	498238	498239	498240	498244
VOA Compounds (ug/L)												
Chloromethane	2.9	2.9	2.3 M	2.9 U	5.0	6.7	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U
Bromomethane	0.9	0.9	0.9 U	0.9 U	0.9 U	0.9 U	0.9 U	0.9 U	0.9 U	0.9 U	0.9 U	0.9 U
Vinyl Chloride	1.1	1.1	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Chloroethane	0.9	0.9	0.9 U	0.9 U	0.9 U	0.9 U	0.9 U	0.9 U	0.9 U	0.9 U	0.9 U	0.9 U
Methylene Chloride	2.4	2.4 B	3.1 B	4.5 B	5.1 B	3.2 B	1.0 B	1.1 B	5.2 B	1.1 B	1.5 B	2.8 B
Acetone	110	110 B	92 B	100 B	27 B	6.6 U	130 B	140 B	51 B	140 B	34 B	14 B
Carbon Disulfide	4.9	7.8	3.3	3.8	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,1-Dichloroethene	1.3	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
1,1-Dichloroethane	1.1	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Trans-1,2-Dichloroethene	1.1	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Cis-1,2-Dichloroethene	1.1	1.1 J	0.7 J	0.6 J	0.5 J	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Chloroform	6.8	6.8	6.9	5.8	2.8	2.9	2.9	2.9	20	8.5	11	9.2
2-Butanone	4.6	5.2	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	0.7	0.7 M	0.7 M	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
1,1,1-Trichloroethane	0.9	0.9 M	1.2 M	0.9 J	1.5	1.0 U	1.0 U	1.0 U	2.1	1.1	1.3	2.2
Carbon Tetrachloride	0.5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Vinyl Acetate	1.7	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U
Bromoform	2.1	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.6	11	3.7
1,2-Dichloropropane	0.6	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Trichloroethene	3.3	2.1	2.0	1.7	0.8 U	0.8 U	0.8 U	0.8 U	5.0	4.5	0.8 U	0.8 U
Benzene	21	16	10	9.7	0.6 M	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	55	70
Dibromochloromethane	0.8	0.9 J	0.9 U	0.9 U	0.9 U	0.9 U	0.9 U	0.9 U	0.9 U	0.9 U	3.2	0.7 J
1,1,2-Trichloroethane	0.3	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Tetrachloroethene	24	69	50	130	32 B	5.2 B	3.5 B	4.5 B	0.7	0.6 U	0.6 U	0.4 J
Toluene	52	47 B	37 B	50	130	9.5	15	15	1.9 B	1.9 B	170 B	0.8 B
Chlorobenzene	0.6	0.6 U	0.6 U	0.9	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
trans-1,3-Dichloropropene	0.5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	4.3	4.3	2.7	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	12	17
cis-1,3-Dichloropropene	0.6	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Styrene	0.5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Total Xylenes	41	41	27	26	1.0 M	1.5 U	1.5 U	1.5 U	3.7	3.7	120	170
2-Chloroethylvinylether	1.5	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
Cyanide (ug/L)												

Appendix B (Continued)

Station:	Influent	Pri-Ef	Final-Ef	Navy-Key	Navy-Ban	Field Blank
Date:	11/29-30	11/29-30	11/29-30	11/30	11/29-30	11/29
Time:	0930-0930	0930-0930	0930-0930	1225	1145-1145	0900
Lab Log #:	498247	498249	498250	498238	498253	498254
Hexachlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U
Pentachlorophenol	5 U	5 U	5 U	5 U	5 U	5 U
Phenanthrene	1	1 U	1 U	4	2	1 U
Anthracene	1 U	1 U	1 U	1 U	1 U	1 U
Di-n-Butyl Phthalate	13	10 U	1 U	34	17	1 U
Fluoranthene	1 U	1 U	1 U	1 U	2	1 U
Pyrene	1 U	1 U	1 U	1 U	1	1 U
Benzidine						
Butylbenzylphthalate	5	3	1 U	2	7	1 U
3,3'-Dichlorobenzidine	5 U	5 U	5 U	5 U	5 U	5 U
Benzo(a)Anthracene	1 U	1 U	1 U	1 U	1 J	1 U
Chrysene	1 U	1 U	1 U	1 U	1 J	1 U
Bis(2-Ethylhexyl)phthalate	23 B	17 B	2 B	9 B	12 B	2 B
Di-n-Octyl Phthalate	3	2	1 U	1 U	1	1 U
Benzo(b)Fluoranthene	1 U	1 U	1 U	1 U		1 U
Benzo(k)Fluoranthene	1 U	1 U	1 U	1 U	2 M**	1 U
Benzo(a)Pyrene	1 U	1 U	1 U	1 U	1 J	1 U
Indeno(1,2,3-cd)Pyrene	1 U	1 U	1 U	1 U	1 U	1 U
Dibenzo(a,h)Anthracene	1 U	1 U	1 U	1 U	1 U	1 U
Benzo(g,h,i)Perylene	1 U	1 U	1 U	1 U	1 U	1 U
----- Pest/PCB Compounds (ug/L) -----						
alpha-BHC	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
beta-BHC	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
delta-BHC	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
gamma-BHC (Lindane)	0.10	0.07	0.04 J	0.05 U	0.05 U	0.05 U
Heptachlor	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Aldrin	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Heptachlor Epoxide	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Endosulfan I	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Dieldrin	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U
4,4'-DDE	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan II	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDD	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDT	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Methoxychlor	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Endrin Ketone	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
alpha-Chlordane	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
gamma-Chlordane	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Toxaphene	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Aroclor-1016 and 1242	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1221						
Aroclor-1232						
Aroclor-1242						
Aroclor-1248	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1254	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Endrin Aldehyde						

Appendix B (Continued)

	Station:	Influent	Pri-Ef	Final-Ef	Navy-Key	Navy-Ban	Field Blank
	Date:	11/29-30	11/29-30	11/29-30	11/30	11/29-30	11/29
	Time:	0930-0930	0930-0930	0930-0930	1225	1145-1145	0900
	Lab Log #:	498247	498249	498250	498238	498253	498254
Cyanide (ug/L)		8	10	14		50	
---BNA Compounds (ug/L)---							
Phenol		11	11	1 M	5	7	1 U
Aniline							
Bis(2-Chloroethyl)Ether		1 U	1 U	1 U	1 U	1 U	1 U
2-Chlorophenol		1 U	1 U	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene		1 U	1 U	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene		3	2	1 U	6	1 U	1 U
Benzyl Alcohol		41	33	5 U	1 M	10 J	5 U
1,2-Dichlorobenzene		1 U	1 U	1 U	1 U	1 U	1 U
2-Methylphenol		1 M	1 M	1 U	1 U	3	1 U
Bis(2-chloroisopropyl)ether		1 U	1 U	1 U	1 U	1 U	1 U
4-Methylphenol		51	58 M	1 U	41	22	1 U
N-Nitroso-Di-n-Propylamine		1 U	1 U	1 U	1 U	1 U	1 U
Hexachloroethane		2 U	2 U	2 U	2 U	2 U	2 U
Nitrobenzene		1 U	1 U	1 U	1 U	1 U	1 U
Isophorone		1 U	1 U	1 U	1 U	1 U	1 U
2-Nitrophenol		5 U	5 U	5 U	5 U	5 U	5 U
2,4-Dimethylphenol		2 U	1 M	2 U	2 U	2 U	2 U
Benzoic Acid		10 U	15	10 U	76	10 U	10 U
Bis(2-Chloroethoxy)Methane		1 U	1 U	1 U	1 U	1 U	1 U
2,4-Dichlorophenol		3 U	3 U	3 U	3 U	3 U	3 U
1,2,4-Trichlorobenzene		1 U	1 U	1 U	1 U	1 U	1 U
Naphthalene		4	3	1 U	2	8	1 U
4-Chloroaniline		5	3	3 U	3 U	3 U	3 U
Hexachlorobutadiene		2 U	2 U	2 U	2 U	2 U	2 U
4-Chloro-3-Methylphenol		2 U	2 U	2 U	2 U	2 U	2 U
2-Methylnaphthalene		4	2	1 U	5	5	1 U
Hexachlorocyclopentadiene		5 U	5 U	5 U	5 U	5 U	5 U
2,4,6-Trichlorophenol		5 U	5 U	5 U	5 U	5 U	5 U
2,4,5-Trichlorophenol		5 U	5 U	5 U	5 U	5 U	5 U
2-Chloronaphthalene		1 U	1 U	1 U	1 U	1 U	1 U
2-Nitroaniline		5 U	5 U	5 U	5 U	5 U	5 U
Dimethyl Phthalate		1 U	1 U	1 U	1 U	1 U	1 U
Acenaphthylene		1 U	1 U	1 U	1 U	1 U	1 U
3-Nitroaniline		5 U	5 U	5 U	5 U	5 U	5 U
Acenaphthene		1 U	1 U	1 U	1 U	1 U	1 U
2,4-Dinitrophenol		10 U	10 U	10 U	10 U	10 U	10 U
4-Nitrophenol		5 U	5 U	5 U	5 U	5 U	5 U
Dibenzofuran		1 U	1 U	1 U	1 U	1 U	1 U
2,4-Dinitrotoluene		5 U	5 U	5 U	5 U	5 U	5 U
2,6-Dinitrotoluene		5 U	5 U	5 U	5 U	5 U	5 U
Diethyl Phthalate		8	6	1 U	1	5	1 U
4-Chlorophenyl-Phenylether		1 U	1 U	1 U	1 U	1 U	1 U
Fluorene		1 U	1 U	1 U	2	1 J	1 U
4-Nitroaniline		5 U	5 U	5 U	5 U	5 U	5 U
4,6-Dinitro-2-Methylphenol		10 U	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine		1 U	1 U	1 U	1 U	1 U	1 U
1,2-Diphenylhydrazine							
4-Bromophenyl-Phenylether		1 U	1 U	1 U	1 U	1 U	1 U

Appendix B (Continued)

Station:	Influent	Pri-Eff	Final-Eff	Navy-Key	Nav-Key	Nav-Ban	Nav-Ban	Field Blank
Date:	11/29-30	11/29-30	11/29-30	11/29	11/29-30	11/29	11/30	11/29
Time:	0930-0930	0930-0930	0930-0930	1400	1225	1145-1145	1515	1135
Lab Log #:	498247	498249	498250	498237	498238	498253	498239	0900
----- Priority pollutant metals (total metal analysis - ug/L) -----								
Antimony	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
Arsenic	2.8	3.1	3.1	1.3	1.0	7.0	1.8	3.7
Beryllium	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Cadmium	5.0 U	5.0 U	5.0 U	15	26	5.0 U	5.0 U	5.0 U
Chromium	10 U	10 U	10 U	10 U	58	10 U	10 U	10 U
Copper	52.7	47.9	16	70	56.2	124	124	120
Lead	11	8.2	3 U	14	8.7	15	7.1	11
Mercury	0.867 B	0.869 B	0.083 B	0.097 B	0.117 B	0.198 B	0.133 B	0.149 B
Nickel	11	11	10 U	10 U	12	15	32	24
Selenium	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Silver	15.6	11.4	3.1	2.1	24.9	4.8	6.1	4.3
Thallium	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Zinc	121	107	55	304	207	158	161	158
								4.0 U

U - Indicates compound was analyzed for but not detected at the given detection limit.

J - Indicates an estimated value when result is less than specified detection limit.

B - This flag is used when the analyte is found in the blank as well as the sample. Indicates possible/probable blank contamination.

M - Indicates an estimated value of analyte found and confirmed by analyst but with low spectral match parameters.

** - Benzo(b+k)Fluoranthene